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Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T380**(E)**(N17)T

NOVEMBER EXAMINATION

NATIONAL CERTIFICATE

ELECTRICAL TRADE THEORY N1

(11041861)

17 November 2016 (X-Paper)
09:00–12:00

This question paper consists of 6 pages and a formula sheet.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
ELECTRICAL TRADE THEORY N1
TIME: 3 HOURS
MARKS: 100

NOTE: If you answer more than the required number of questions, only the required number of questions will be marked. All work you do not want to be marked, must be clearly crossed out.

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Read ALL the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Write neatly and legibly.

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QUESTION 1

Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (1.1 – 1.20) in the ANSWER BOOK.

1.1 A registered installation electrician may issue a certificate of competency.

1.2 The symbol for double insulation is a square within another square.

1.3 The colour green is used to indicate first-aid facilities.

1.4 I = V x R

1.5 The magnetic field of a magnet is located in the space where magnetic attraction takes place.

1.6 The purpose of crimpling pliers is to crimp ferrules around a conductor.

1.7 EMF is measured with a load while potential difference is measured without a load connected.

1.8 Cells can deliver only a certain amount of current.

1.9 A commutator switches direct current to alternating current.

1.10 An EMF will be generated when a conductor is moved through a magnetic field.

1.11 The average value of a sine wave occurs at 0,707 of the maximum value.

1.12 Cadmium-nickel cells are secondary cells.

1.13 A moving-coil instrument can only be used to measure direct current.

1.14 In a measuring instrument the purpose of a damping mechanism is to prevent the pointer needle from oscillating.

1.15 A bar magnet consists of a North Pole and a South Pole.

1.16 An insulator is constructed of metallic material.

1.17 Conductive cable sheaths and armouring must be earthed.

1.18 All conductors of any electrical circuit shall originate at the same distribution board.

1.19 Hot and cold water pipes and all water heaters must be bonded.

1.20 Polarised electronic capacitors may be connected in reverse polarity without any danger.

(20 × 1) **[20]**

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QUESTION 2

A standard SABS compliant symbolic safety sign consists of a geometric shape, a colour and a pictogram.

Redraw and complete the following table for the given geometric symbols in your ANSWER BOOK. Fill in the matching GEOMETRIC SHAPE (drawing), the MEANING of the shape (e.g. informative) and the COLOUR (e.g. silver) that each represents:

	Symbol	Geometric Shape	Meaning	Colour
2.1	Triangular			
2.2	Circular with diagonal			
2.3	Disc			
2.4	Square with no border			
2.5	Square with thin red border			

[15]

QUESTION 3

3.1 Redraw and complete the following table in your ANSWER BOOK. Name the quantities used in the following equation and also indicate the standard unit for each:

$$Q = I^2Rt$$

	Symbol	Quantity	Standard Unit
Example	V	Voltage	Volt
3.1.1	Q		
3.1.2	I		
3.1.3	R		
3.1.4	t		

(8 × 1) (8)

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3.2 Two resistors of 10 Ω each are connected in parallel. This combination is then connected in series to a resistor of 5 Ω. Power is supplied from a 50 V source.

Draw a neat, fully labelled diagram of the circuit and determine: (5)

3.2.1 The total resistance of the circuit (5)

3.2.2 The total current flowing through the circuit (2)

3.2.3 The power dissipated in the circuit (2)

3.2.4 The energy consumed by the circuit in ONE hour (4)
[26]

QUESTION 4

4.1 What is an ideal transformer? (1)

4.2 Which liquid is used for transformer cooling? (1)

4.3 A single-phase transformer has a supply voltage of 220 V and a primary current of 20 A. The number of windings on the primary coil is 200 turns and on the secondary coil it is 50 turns.

Calculate:

4.3.1 The turns ratio

4.3.2 The secondary voltage

4.3.3 The secondary current

(3 × 2) (6)

4.4 State the SIX factors that the capacity of a lead-acid battery depends on. (6)
[14]

QUESTION 5

5.1 Redraw and complete the following table in your ANSWER BOOK. List FOUR methods of producing electricity and also give an example of each.

Means of Producing Electricity	Example

(8)

5.2 Name TWO types of transformers which are known to you. (2)
[10]

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QUESTION 6

6.1 Which FOUR conductors are generally used in electrical practice? (4)

6.2 Define an *insulator*. (3)

6.3 Can a diode be connected directly across a supply? Answer YES or NO and explain your answer. (2)
[9]

QUESTION 7

7.1 Briefly explain what a capacitor is. (2)

7.2 THREE capacitors of 5 µF, 10 µF and 20 µF are connected in series. Determine the total capacitance of this combination. (4)
[6]

TOTAL: 100

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ELECTRICAL TRADE THEORY N1

FORMULA SHEET

RESISTORS

$$R = \frac{V}{I}$$

$$R_T = R_1 + R_2 + R_3 + ...$$

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + ...$$

POWER

$$P = V \times I$$

$$P = I^2 \times R$$

$$P = \frac{V^2}{R}$$

ENERGY

$$W = P \times t$$

$$W = VI \times t$$

$$W = I^2 R \times t$$

$$W = \frac{V^2}{R} \times t$$

CELLS

$$E = V + (I \times r)$$

$$R_T = R + r$$

$$I = \frac{V}{R}$$

$$I = \frac{E}{(R + r)}$$

RESISTIVITY

$$R = \frac{\rho \times \ell}{a}$$

$$a = \frac{\pi \times d^2}{4}$$

TEMPERATURE COEFFICIENT

$$R_t = R_o(1 + L_o t)$$

TRANSFORMERS

$$\frac{V_1}{V_2} = \frac{N_1}{N_2} = \frac{I_2}{I_1}$$

CAPACITORS

$$C_T = C_1 + C_2 + C_3 + ...$$

$$\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + ...$$

FREQUENCY

$$f = np$$

$$f = \frac{1}{T}$$

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